

**U.S.ENVIRONMENTAL PROTECTION AGENCY
NATIONAL ANALYTICAL RADIATION ENVIRONMENTAL LABORATORY
540 S. MORRIS AVE., MONTGOMERY, AL 36115
U ANALYSES**

REPORT OF SAMPLE DELIVERY GROUP #1900153

Project: Canadian Radium and Uranium 9/19
Analysis method: Actinides (Uranium) by Extraction Chromatography
Report ID: 1900153-U
Report type: Original
Date reported: 11/04/2019
Total pages in report: 11

SAMPLES

NAREL Sample #	Client Sample ID	Location	Matrix	Date Collected	Date Received
B9.10556G	RB-190908	NY:MT. KISCO	WATER	09/08/2019	09/10/2019
B9.10557H	RB-190909	NY:MT. KISCO	WATER	09/09/2019	09/10/2019

EXCEPTIONS

1. **Packaging and shipping** – No problems were observed.
2. **Documentation** – No problems were observed.
3. **Sample preparation** – No problems were encountered.
4. **Analysis** – No problems were encountered.
5. **Holding times** – No holding times were specified.

QUALITY CONTROL

1. **QC samples** – All QC analysis results met NAREL acceptance criteria.
2. **Yields** – All chemical yields were within acceptance limits.
3. **Instruments** – Response and background checks for all instruments used in these analyses met NAREL acceptance criteria.

ACCREDITATION



NAREL is accredited by the Oregon Environmental Laboratory Accreditation Program (ORELAP) to the TNI standard. NAREL maintains accreditation for all its radiological analyses except the following:

- Analyses of drinking water
- Gross alpha and gross beta of solid matrices, including swipes
- Tritium analysis of solid matrices, including swipes
- Analyses for Ra-226 by method NAREL RA-07-EC
- Analyses for Am-241 by method NAREL ACT-02F
- Curium-244/243

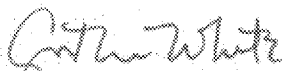
CERTIFICATION

I certify that this data report complies with the terms and conditions of the Project Acceptance Form and/or the Quality Assurance Project Plan, except as noted above. Release of the data contained in this report has been authorized by the Director of the Center for Environmental Radioanalytical Laboratory Science and the NAREL Quality Assurance Manager, or their designees, as verified by the following signatures.



Velinda Herbert
Quality Assurance Manager, NAREL

11/5/19
Date



Cynthia White
Director, Center for Environmental Radioanalytical
Laboratory Science

11-5-19
Date

If you have questions about the data, please contact Cynthia White (white.cindy@epa.gov).

GENERAL INFORMATION

SAMPLE TYPES

BLD	Blind sample
FBK	Field blank
SAM	Normal sample

ANALYSIS QC TYPES

ANA	Normal analysis
DUP	Laboratory duplicate
LCS	Laboratory control sample, or blank spike
LCX	Laboratory control sample duplicate
MS	Matrix spike
MSD	Matrix spike duplicate (not currently analyzed)
RBK	Method blank
STD	External standard (used for ^{228}Ra yield determination)

QUALITY INDICATORS

RPD	Relative Percent Difference
%R	Percent Recovery
Z	Number of standard deviations by which a QC measurement differs from the expected value

RADIOCHEMICAL DATA

Radiochemical analyses usually require the subtraction of an instrument background measurement result from a gross sample measurement result. Both values are positive, but when the sample activity is low, random variations in the two measurements can cause the gross value to be less than the background, resulting in a measured activity less than zero. Although negative activities have no physical significance, they do have statistical importance, as for example in the evaluation of trends or the comparison of two groups of samples.

To the extent practical, it is the policy of NAREL to report results as generated, whether positive, negative, or zero, together with the “2-sigma” measurement uncertainty and a sample-specific estimate of the minimum detectable concentration (MDC). The measurement result, uncertainty, and MDC are always expressed in the same unit of measurement.

EVALUATION OF QC ANALYSES

A method blank result is considered unacceptable if it is more than 3 standard deviations below zero or more than 3 standard deviations above a predetermined upper control limit. For some analyses NAREL has set the upper control limit at zero. For others the control limit is a small positive number.

NAREL evaluates the results of duplicate and spike analyses using “Z scores.” A Z score is the number of standard deviations by which the QC result differs from its ideal value. Generally the score is considered acceptable if its absolute value is not greater than 3.

The Z score for a spiked sample is computed by dividing the difference between the measured value and the target value by the combined standard uncertainty of the difference. The Z score for a duplicate analysis is computed by dividing the difference between the two measured values by the combined standard uncertainty of the difference.

NAREL reports the “relative percent difference,” or RPD, between duplicate results and the “percent recovery,” or %R, for spiked analyses, but does not use these values for evaluation of most analyses. An exception is the use of %R in the evaluation of gross alpha matrix spike results. A gross alpha matrix spike result is considered acceptable if either $|Z| \leq 3$ or $60 \leq \%R \leq 110$.

Date Shipped: 9/9/2019
Carrier Name: FedEx
Airbill No: 7761-9090-7836

CHAIN OF CUSTODY RECORD

Canadian Radium & Uranium Corp./NY
Contact Name: Bernard Nwosu
Contact Phone: 908-565-2980

No: 2-090919-0032-0030-0001

Lab: NAREL
Lab Contact: Tonya Hudson
Lab Phone: 343-270-3433

Lab #	Sample #	Location	Matrix	Analyses	Sample Date	Sample Time	Numb Cont	Container	Preservative	Lab QC
	RB-190908	✓ RB-190908	Blank	Alpha Spec (U, Th) & Gamma Spec	9/8/2019	16:00	✓ 4	1 L poly	HNO3 pH<2	N 23
	RB-190909	✓ RB-190908	Blank	Alpha Spec (U, Th) & Gamma Spec	9/9/2019	09:00	✓ 4	1 L poly	HNO3 pH<2	N 24

Special Instructions: Please email results to s.suribay@westonsolutions.com and ben.nwosu@westonsolutions.com. Samples to be run for isotopic Uranium via NAREL ACT-02ETH, Isotopic Uranium via NAREL ACT-02F-U, other gamma isotopes via NAREL GM-01-FA, and Radium-226 and Radium-228 via 21-day ingrowth, 60 day TAT.

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt
11/11/19 211/11/19	Bernard Hamm (Nestor)	9/9/19/16:00	[Signature] (Secretary Chambers)	9/10/19 09:20	see page 1

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL ANALYTICAL RADIATION ENVIRONMENTAL LABORATORY**

SDG #1900153

ANALYSIS SUMMARY

Analysis method: NAREL U-EICHROM
Title: Actinides (Uranium) by Extraction Chromatography

NAREL Sample #	Client Sample ID	QC Type	Date Completed	Preparation Batch #	Assay Batch #
B9.10556G	RB-190908		10/22/2019	0016737J	0024613D
B9.10556G	RB-190908	DUP	10/22/2019	0016737J	0024613D
B9.10557H	RB-190909		10/22/2019	0016737J	0024613D
LCS-00785616P *		LCS	10/22/2019	0016737J	0024613D
RBK-00785615N *		RBK	10/22/2019	0016737J	0024613D

* Samples marked with an asterisk are not in this sample delivery group but were analyzed with it for QC purposes.

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL ANALYTICAL RADIATION ENVIRONMENTAL LABORATORY**

SDG #1900153

SAMPLE ANALYSIS REPORT

Lab sample #:	B9.10556G	Amount analyzed:	2.000e-01 L
Client sample ID:	RB-190908	Preparation batch #:	0016737J
Matrix:	WATER	Assay batch #:	0024613D
Collected:	2019-09-08 16:00 EDT	Prep procedure:	N/A
Sample type:	SAM	Analysis method:	NAREL U-EICHROM
Dry/wet weight:	N/A	Analyst:	SPK
Ash/dry weight:	N/A	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
10/21/2019 15:48	1000.0	AS33	CEB

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	DLC	MDC	Unit	Reference Date
U234	1.36e-01	9.7e-02	2.0e-02	7.6e-02	PCI/L	10/21/2019 15:48 CDT
U235	0.00e+00	3.8e-02	2.4e-02	9.1e-02	PCI/L	10/21/2019 15:48 CDT
U238	6.56e-02	7.6e-02	3.5e-02	1.1e-01	PCI/L	10/21/2019 15:48 CDT

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL ANALYTICAL RADIATION ENVIRONMENTAL LABORATORY**

SDG #1900153

SAMPLE ANALYSIS REPORT

Lab sample #:	B9.10556G	Amount analyzed:	2.000e-01 L
Client sample ID:	RB-190908	Preparation batch #:	0016737J
Matrix:	WATER	Assay batch #:	0024613D
Collected:	2019-09-08 16:00 EDT	Prep procedure:	N/A
Sample type:	SAM	Analysis method:	NAREL U-EICHROM
Dry/wet weight:	N/A	Analyst:	SPK
Ash/dry weight:	N/A	QC type:	DUP
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
10/21/2019 15:48	1000.0	AS34	CEB

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	DLC	MDC	Unit	Reference Date
U234	3.96e-02	7.0e-02	4.4e-02	1.2e-01	PCI/L	10/21/2019 15:48 CDT
U235	1.19e-02	5.3e-02	3.4e-02	1.1e-01	PCI/L	10/21/2019 15:48 CDT
U238	7.93e-02	8.1e-02	3.5e-02	1.0e-01	PCI/L	10/21/2019 15:48 CDT

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL ANALYTICAL RADIATION ENVIRONMENTAL LABORATORY**

SDG #1900153

SAMPLE ANALYSIS REPORT

Lab sample #:	B9.10557H	Amount analyzed:	2.000e-01 L
Client sample ID:	RB-190909	Preparation batch #:	0016737J
Matrix:	WATER	Assay batch #:	0024613D
Collected:	2019-09-09 09:00 EDT	Prep procedure:	N/A
Sample type:	SAM	Analysis method:	NAREL U-EICHROM
Dry/wet weight:	N/A	Analyst:	SPK
Ash/dry weight:	N/A	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
10/21/2019 15:48	1000.0	AS35	CEB

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	DLC	MDC	Unit	Reference Date
U234	1.93e-02	5.3e-02	3.4e-02	1.0e-01	PCI/L	10/21/2019 15:48 CDT
U235	3.47e-02	7.3e-02	4.6e-02	1.3e-01	PCI/L	10/21/2019 15:48 CDT
U238	3.86e-02	6.0e-02	2.8e-02	8.9e-02	PCI/L	10/21/2019 15:48 CDT

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL ANALYTICAL RADIATION ENVIRONMENTAL LABORATORY**

SDG #1900153

SAMPLE ANALYSIS REPORT

Lab sample #:	LCS-00785616P	Amount analyzed:	1.000e+00 SAMP
Client sample ID:	N/A	Preparation batch #:	0016737J
Matrix:	N/A	Assay batch #:	0024613D
Collected:	N/A	Prep procedure:	N/A
Sample type:	N/A	Analysis method:	NAREL U-EICHROM
Dry/wet weight:	N/A	Analyst:	SPK
Ash/dry weight:	N/A	QC type:	LCS
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
10/21/2019 15:48	1000.0	AS37	CEB

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	DLC	MDC	Unit	Reference Date
U234	2.05e+00	2.4e-01	4.2e-03	1.6e-02	PCI	10/21/2019 15:48 CDT
U235	1.49e-01	5.3e-02	5.1e-03	1.9e-02	PCI	10/21/2019 15:48 CDT
U238	2.06e+00	2.4e-01	7.4e-03	2.2e-02	PCI	10/21/2019 15:48 CDT

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL ANALYTICAL RADIATION ENVIRONMENTAL LABORATORY**

SDG #1900153

SAMPLE ANALYSIS REPORT

Lab sample #:	RBK-00785615N	Amount analyzed:	1.000e+00 SAMP
Client sample ID:	N/A	Preparation batch #:	0016737J
Matrix:	N/A	Assay batch #:	0024613D
Collected:	N/A	Prep procedure:	N/A
Sample type:	N/A	Analysis method:	NAREL U-EICHROM
Dry/wet weight:	N/A	Analyst:	SPK
Ash/dry weight:	N/A	QC type:	RBK
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
10/21/2019 15:48	1000.0	AS38	CEB

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	DLC	MDC	Unit	Reference Date
U234	9.60e-03	1.3e-02	6.7e-03	2.0e-02	PCI	10/21/2019 15:48 CDT
U235	-1.15e-03	7.6e-03	6.7e-03	2.1e-02	PCI	10/21/2019 15:48 CDT
U238	1.25e-02	1.5e-02	6.7e-03	2.0e-02	PCI	10/21/2019 15:48 CDT

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL ANALYTICAL RADIATION ENVIRONMENTAL LABORATORY**

SDG 1900153

PREPARATION BATCH SUMMARY

Preparation batch #: 0016737J
Analysis method: NAREL U-EICHROM
Preparation procedure: N/A

NAREL Sample #	Client Sample ID	Analysis #	QC Type	Yield	$\pm 2 \sigma$ Uncertainty	Analyst
B9.10556G	RB-190908	00785617Q		91.84 %	7.96 %	SPK
B9.10556G	RB-190908	00785614M	DUP	95.35 %	8.22 %	SPK
B9.10557H	RB-190909	00785618R		93.87 %	8.03 %	SPK
LCS-00785616P *		00785616P	LCS	87.88 %	7.72 %	SPK
RBK-00785615N *		00785615N	RBK	99.95 %	8.55 %	SPK

* Samples marked with an asterisk are not in this sample delivery group but were analyzed with it for QC purposes.

QC RESULTS FOR BATCH 0016737J

NAREL Sample #	Analysis #	QC Type	Analyte	%R	RPD	Z	Evaluation
B9.10556G	00785614M	DUP	U234		109.9	-1.61	PASS
B9.10556G	00785614M	DUP	U235		200.0	0.36	PASS
B9.10556G	00785614M	DUP	U238		18.9	0.25	PASS
LCS-00785616P	00785616P	LCS	U234	104.5		0.74	PASS
LCS-00785616P	00785616P	LCS	U235	160.1		2.11	WARN
LCS-00785616P	00785616P	LCS	U238	102.1		0.36	PASS
RBK-00785615N	00785615N	RBK	U234				PASS
RBK-00785615N	00785615N	RBK	U235				PASS
RBK-00785615N	00785615N	RBK	U238				PASS